National Semiconductor

August 1998

54FCT245
Octal Bidirectional Transceiver with TRI-STATE® Outputs

General Description

The ’FCT245 contains eight non-inverting bidirectional buffers with TRI-STATE outputs and is intended for bus-oriented applications. Current sinking capability is 48 mA on both the A and B ports. The Transmit/Receive (T/$\overline{R}$) input determines the direction of data flow through the bidirectional transceiver. Transmit (active HIGH) enables data from A ports to B ports; Receive (active LOW) enables data from B ports to A ports. The Output Enable input, when HIGH, disables both A and B ports by placing them in a High Z condition.

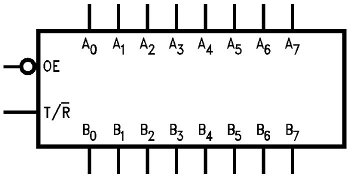
Features

- TTL input and output level compatible
- A and B output sink capability of 48 mA, source capability of 12 mA
- CMOS power consumption
- Standard Microcircuit Drawing (SMD) 5962-8762901

Ordering Code:

Military	Package Number	Package Description
54FCT245DMQB	J20A	20-Lead Ceramic Dual-In-Line
54FCT245FMQB	W20A	20-Lead Cerpak
54FCT245LMQB	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

Logic Symbol



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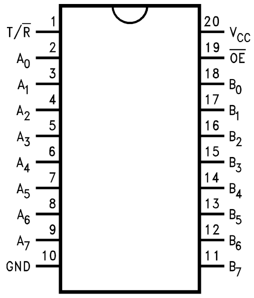
Connection Diagrams

Pin Assignment for DIP and Flatpak.



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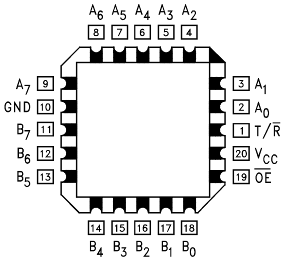
Pin Assignment for LCC



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Pin Descriptions

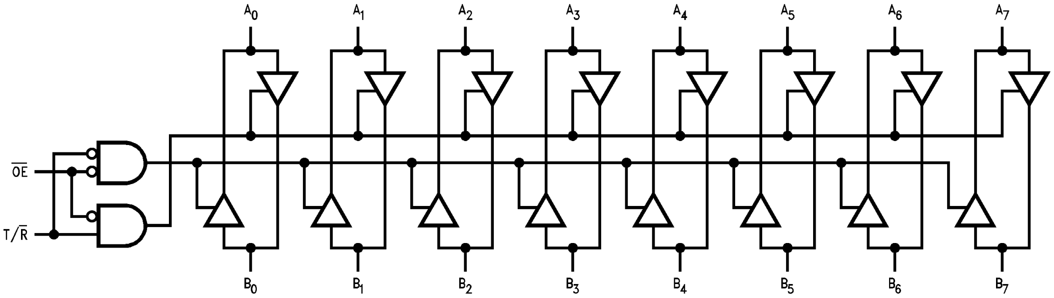
Pin Names	Description
$\overline{OE}$	Output Enable Input (Active LOW)
T/$\overline{R}$	Transmit/Receive Input
A_0–A_7	Side A Inputs or TRI-STATE Outputs
B_0–B_7	Side B Inputs or TRI-STATE Outputs

Truth Table

Inputs		Output
$\overline{OE}$	T/$\overline{R}$	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	High Z State

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial

Logic Diagram



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Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.

Storage Temperature	−65˚C to +150˚C
Ambient Temperature under Bias	−55˚C to +125˚C
Junction Temperature under Bias	
Ceramic	−55˚C to +175˚C
V_{CC} Pin Potential to	
Ground Pin	−0.5V to +7.0V
Input Voltage (Note 2)	−0.5V to +7.0V
Input Current (Note 2)	−30 mA to +5.0 mA
Voltage Applied to Any Output	
in the Disabled or	
Power-off State	−0.5V to 5.5V
in the HIGH State	−0.5V to V_{CC}
Current Applied to Output	
in LOW State (Max)	twice the rated I_{OL} (mA)

Recommended Operating Conditions

Free Air Ambient Temperature	
Military	−55˚C to +125˚C
Supply Voltage	
Military	+4.5V to +5.5V

Note 1: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Note 2: Either voltage limit or current limit is sufficient to protect inputs.

DC Electrical Characteristics

Symbol	Parameter		FCT245		Units	V_{CC}	Conditions
			Min	Max			
V_{IH}	Input HIGH Voltage		2.0		V		Recognized HIGH Signal
V_{IL}	Input LOW Voltage			0.8	V		Recognized LOW Signal
V_{CD}	Input Clamp Diode Voltage			−1.2	V	Min	I_{IN} = −18 mA ($\overline{OE}$, T/$\overline{R}$)
V_{OH}	Output HIGH Voltage	54FCT	4.3		V	Min	I_{OH} = −300 uA (A_n, B_n)
		54FCT	2.4		V	Min	I_{OH} = −12 mA (A_n, B_n)
V_{OL}	Output LOW Voltage	54FCT		0.2	V	Min	I_{OL} = 300 uA (A_n, B_n)
		54FCT		0.55	V	Min	I_{OL} = 48 mA (A_n, B_n)
I_{IH}	Input HIGH Current			5 5	µA	Max	V_{IN} = 2.7V ($\overline{OE}$, T/$\overline{R}$) V_{IN} = V_{CC} ($\overline{OE}$, T/$\overline{R}$)
I_{BVIT}	Input HIGH Current Breakdown Test (I/O)			20	µA	Max	V_{IN} = 5.5V (A_n, B_n)
I_{IL}	Input LOW Current			−5	µA	Max	V_{IN} = 0.0V ($\overline{OE}$, T/$\overline{R}$)
I_{OS}	Output Short-Circuit Current			−60	mA	Max	V_{OUT} = 0.0V (A_n, B_n)
I_{CCQ}	Power Supply Current			1.5	mA	Max	V_{IN} = 0.2V or V_{IN} = 5.3V, V_{CC} = 5.5V
ΔI_{CC}	Power Supply Current			2.0	mA	Max	V_{CC} = 5.5V, V_{IN} = 3.4V
I_{CCT}	Total Power Supply Current			6.0	mA		V_{IN} = 3.4V or V_{IN} = GND, $\overline{OE}$ = T/$\overline{R}$ = GND, V_{CC} = 5.5V, f_I = 10Mhz, outputs open, one bit toggling - 50% duty cycle
				5.5	mA	Max	V_{IN} = 5.3V or V_{IN} = 0.2V,$\overline{OE}$ = T/$\overline{R}$ = GND, V_{CC} = 5.5V, f_I = 10Mhz, outputs open, one bit toggling - 50% duty cycle
I_{CCD}	Dynamic I_{CC} (Note 3)			0.4	mA/ MHz	Max	Outputs Open, $\overline{OE}$ =GND, T/$\overline{R}$ = GND or V_{CC} One Bit Toggling, 50% Duty Cycle

Note 3: Guaranteed but not tested.

AC Electrical Characteristics

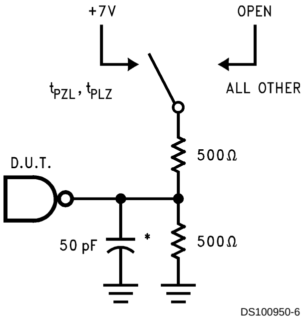
Symbol	Parameter	54FCT		Units	Fig. No.
		T_A = −55°C to +125°C V_{CC} = 4.5V–5.5V C_L = 50 pF			
		Min	Max		
t_{PLH}	Propagation Delay	1.5	7.5	ns	*Figure 4*
t_{PHL}	Data to Outputs	1.5	7.5		
t_{PZH}	Output Enable	1.5	10.0	ns	*Figure 5*
t_{PZL}	Time	1.5	10.0		
t_{PHZ}	Output Disable	1.5	10.0	ns	*Figure 5*
t_{PLZ}	Time	1.5	10.0		

Capacitance

Symbol	Parameter	Max	Units	Conditions T_A = 25°C
C_{IN}	Input Capacitance	10.0	pF	V_{CC} = 0V ($\overline{OE}$, T/$\overline{R}$)
$C_{I/O}$ (Note 4)	I/O Capacitance	12.0	pF	V_{CC} = 5.0V (A_n, B_n)

Note 4: $C_{I/O}$ is measured at frequency f = 1 MHz, per MIL-STD-883B, Method 3012.

AC Loading



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*Includes jig and probe capacitance

FIGURE 1. Standard AC Test Load

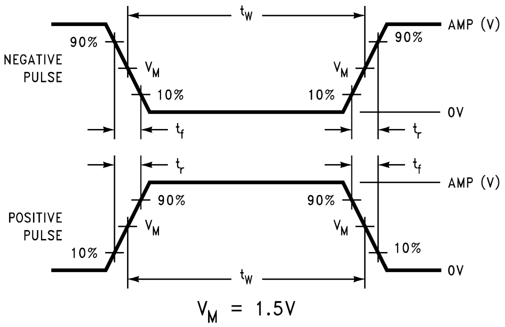

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FIGURE 2. Test Input Signal Levels

Amplitude	Rep. Rate	t_w	t_r	t_f
3.0V	1 MHz	500 ns	2.5 ns	2.5 ns

FIGURE 3. Test Input Signal Requirements

AC Waveforms

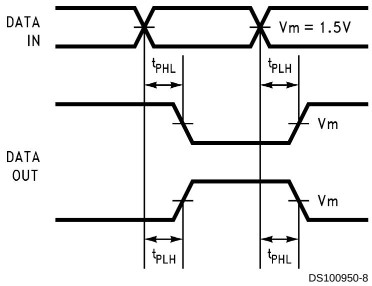


FIGURE 4. Propagation Delay Waveforms for Inverting and Non-Inverting Functions

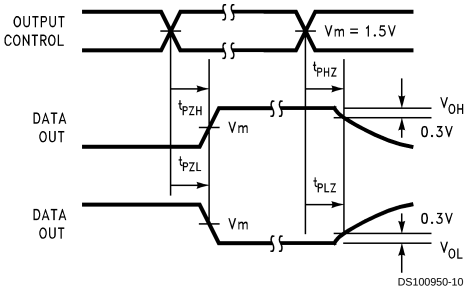
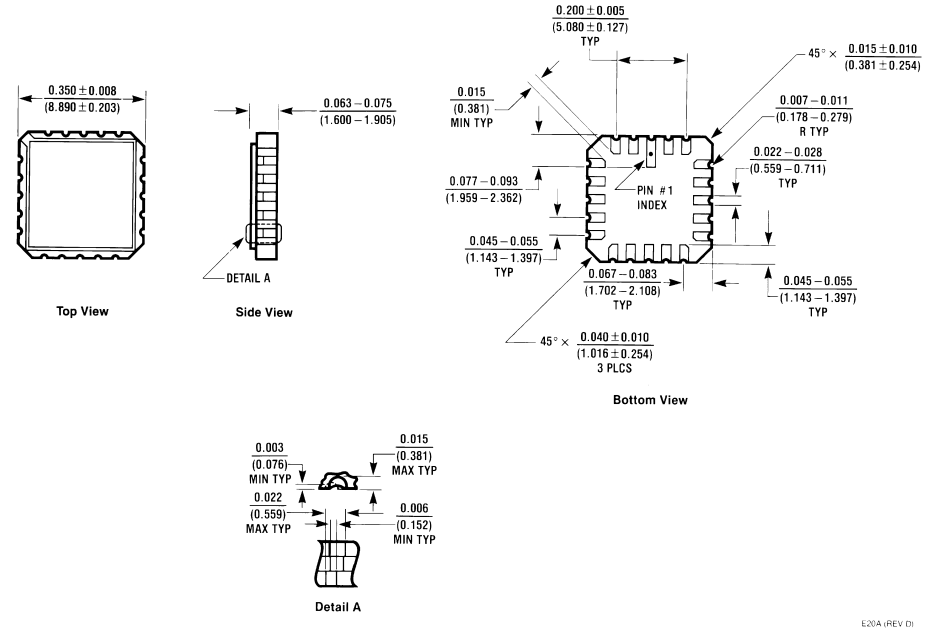
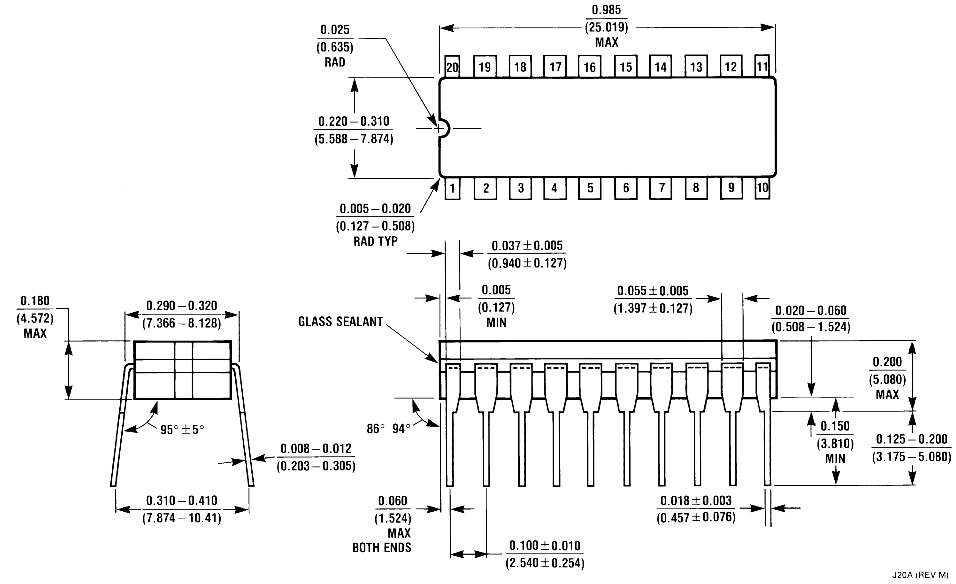


FIGURE 5. TRI-STATE Output HIGH and LOW Enable and Disable Times

Physical Dimensions inches (millimeters) unless otherwise noted

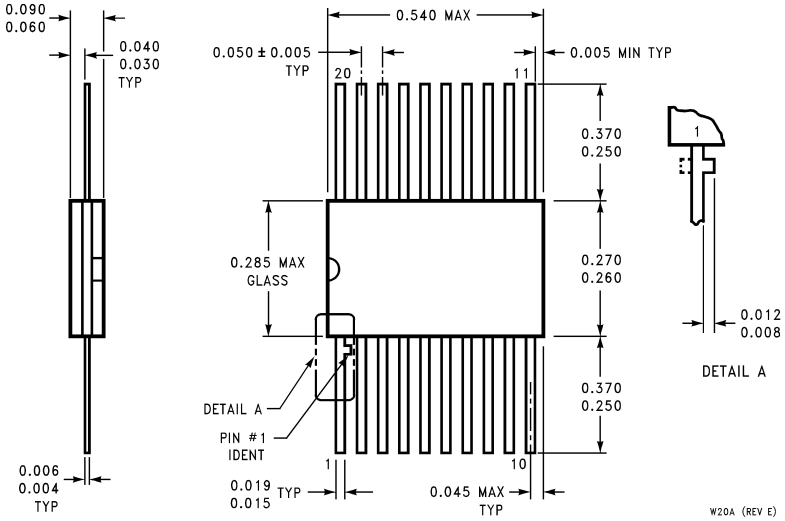


20-Terminal Ceramic Chip Carrier (L)
NS Package Number E20A



20-Lead Ceramic Dual-In-Line Package (D)
NS Package Number J20A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



20-Lead Ceramic Flatpak (F)
NS Package Number W20A

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